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EXAMINER	
NGUYEN, LEON VIET Q	

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2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/823,196	KUCHI ET AL.	
	Examiner	Art Unit	
	Leon-Viet Q. Nguyen	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,13-16,18,19 and 25-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *13-16,18,19 and 61* is/are allowed.

6)☒ Claim(s) *1,25-36,38-40,42-55 and 57-59* is/are rejected.

7)☒ Claim(s) *37,41,56 and 60* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. This office action is in response to communication filed on 8/29/07. Claims 2-12, 17 and 20-24 have been cancelled. Claims 25-61 have been added. Claims 1, 13-16, 18, 19, and 25-61 are pending on this application.

2. Applicant's arguments with respect to claim 1 has been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 19, it is unclear which transmission mode the second signal is processed in accordance with. Is it the first transmission mode or the second transmission mode?

5. Claim 45 recites the limitation "the device of claim 25". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 29-31, 40, 42, 43, 58-50, and 59 rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545)

Re claim 1, Zhang discloses a method comprising:

receiving a wireless communication signal from at least two spatially separated transmit antennas associated with at least one transmitter or from at least two transmitters (page 541, right side, last paragraph. M transmit and N receive antenna); and

performing on a corresponding complex composite base band received signal (page 541, left side, second paragraph. The system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary), comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, joint pre-filtering and reduced state sequence detection of real and imaginary parts of signals (page 542, right side, first paragraph. fig. 1), from a single receive antenna branch or

from a plurality of receive antenna branches (it would be necessary to perform the process on at least one antenna branch), separately to filter out noise plus residual interference across inphase and quadrature branches (it is well known in the art that filters are used for reducing noise and intereference).

Re claim 29, Zhang discloses a method where joint pre-filtering comprises using a set of feed forward weights (page 542, right side, first paragraph, equation 6. W^H is a matrix comprising pre-filter weights) to minimize an error term (page 542, right side, first paragraph, equation 6) that includes an I-Q MIMO feedback filter (page 542, right side, first paragraph, equation 6. B^H is a matrix comprising feed back filter weights), wherein a feed forward filter separately filters real and imaginary parts of baseband data collected from at least one receive antennas (it is well known that a filter would filter the imaginary and real part of an 8PSK modulated signal).

Re claim 30, Zhang discloses a method where joint pre-filtering comprises optimizing filter coefficients according to a MMSE criterion (page 542, right side, first paragraph, equation 7).

Re claim 31, Zhang discloses a method where reduced state sequence detection comprises use of a reduced state soft output sequence estimation (JRSSE in fig. 1) to jointly detect I-Q symbol streams that employs a branch metric comprised of I-Q components of the composite signal (page 541, left side, second paragraph. The

system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary. Since the composite signal comprises of an I and Q component, it is interpreted that the I-Q symbol streams of the composite signal are detected).

Re claim 40, Zhang discloses a method where receiving receives desired information from each of the at least two transmit antennas (fig. 1, page 545 left side first paragraph).

Re claim 42, the claimed limitations recited have been analyzed and rejected with respect to claim 1. Zhang teaches the device (fig. 1) as disclosed by the method.

Re claim 43, Zhang discloses a device where said receiver is coupled to a plurality of receive antennas (fig. 1, receive antennas 1 to N).

Re claim 48, the claimed limitations recited have been analyzed and rejected with respect to claim 29.

Re claim 49, the claimed limitations recited have been analyzed and rejected with respect to claim 30.

Re claim 50, the claimed limitations recited have been analyzed and rejected with respect to claim 31.

Re claim 59, the claimed limitations recited have been analyzed and rejected with respect to claim 40.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 25-28 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) in view of Onggosanusi et al (US20040192215).

Re claim 25, Zhang fails to teach a method where the real modulation signal is a GMSK signal, and where receiving includes rotating the received signals in complex space such that the GMSK signal is binary modulated.

However Onggosanusi teaches where the real modulation signal is a

GMSK signal (¶0039-¶0040, ¶0045), and where receiving includes rotating the received signals in complex space (block 510 in fig. 5, ¶0044) such that the GMSK signal is binary modulated (¶0040-¶0043. a_k is modulated using binary phase shift keying).

Therefore taking the combined teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang. The motivation to combine Onggosanusi and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 26, Zhang fails to teach a method where the base band received signal is a sum comprised of at least one GMSK signal, further comprising de-rotating the base band received signal with a factor $e^{-j\Phi k}$ such that the component GMSK signal is forced to be binary modulated.

However Onggosanusi teaches where the base band received signal is a sum comprised of at least one GMSK signal (¶0039-¶0040, ¶0045), further comprising de-rotating the base band received signal with a factor $e^{-j\Phi k}$ (¶0044. $-j^{m+1}$ is equivalent to $e^{-j\Phi k)}$ such that the component GMSK signal is forced to be binary modulated.

Therefore taking the combined teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang. The motivation to combine Onggosanusi and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 27, the modified invention of Zhang teaches a method further comprising splitting the I and Q parts of the de-rotated base band signal (block 515 in fig. 5 of Onggosanusi, ¶0044 of Onggosanusi).

Re claim 28, the modified invention of Zhang teaches a method further comprising de-rotating (block 510 in fig. 5 of Onggosanusi) and I-Q splitting the base band signal (block 515 in fig. 5 of Onggosanusi) to yield modulation formats comprising binary, real and imaginary data streams (¶0042 and equation (1) of Onggosanusi).

Therefore taking the combined teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang. The motivation to combine Onggosanusi and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 44, the claimed limitations recited have been analyzed and rejected with respect to claim 25.

Re claim 45, the claimed limitations recited have been analyzed and rejected with respect to claim 26.

Re claim 46, the claimed limitations recited have been analyzed and rejected with respect to claim 27.

Re claim 47, the claimed limitations recited have been analyzed and rejected with respect to claim 28.

10. Claims 32, 33, 36, 38, 51, 52, 55, and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) in view of Olsson et al (US20050111596).

Re claim 32, Zhang fails to teach a method configured in an 8PSK blind I-Q interference suppression receiver when a GMSK interferer is present.

However Olsson teaches a method configured in an 8PSK blind I-Q interference suppression receiver (¶0042-¶0043, the blind modulation detection of a desired signal. Also in an EDGE system, signals of either GMSK or 8PSK modulation are present) when a GMSK interferer is present (¶0043, an interferer is GMSK-modulated).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to

combine Olsson and Zhang would be to give a smaller residual error after channel estimation, compared to a conventional receiver (¶0043).

Re claim 33, Zhang teaches an I-Q MIMO MMSE joint detection receiver (abstract) but fails to teach a method configured in a GMSK-8PSK or 8PSK-GMSK modulation scheme.

However Olsson teaches a method configured in GMSK-8PSK or 8PSK-GMSK (fig. 14, ¶0028. The desired signal is GMSK modulated and the interferer is 8PSK modulated).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Zhang and Olsson would be to eliminate the degradation in 8PSK-modulated interference (¶0063).

Re claim 36, Zhang teaches a method further comprising sequentially estimating desired and dominant interfering signal channel impulse (page 542, right side, first paragraph. It would be obvious to one of ordinary skill in the art that the impulse response be estimated before it is shortened and reshaped. Furthermore it is well known in the art that in joint equalization systems, data and interference are both detected) responses but fails to teach where channel estimation blindly identifies a dominant interferer modulation type and its training sequence.

However Olsson teaches channel estimation blindly identifies a dominant interferer modulation type (¶0043-¶0044) and its training sequence (¶0042).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Olsson and Zhang would be to give a smaller residual error after channel estimation, compared to a conventional receiver (¶0043).

Re claim 38, the Zhang fails to teach a method where identifying the signal modulation type and training sequence comprises searching through known training sequences, and analyzing residual signals to identify a type of dominant interference.

However Olsson teaches searching through known training sequences (¶0042, the position and content of the training sequence is well known. Furthermore it is well known in the art that the training sequence incoming of an incoming signal is compared to known training sequences to achieve synchronization), and analyzing residual signals to identify a type of dominant interference (¶0044, decision mechanism 18 in fig. 7).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Olsson and Zhang would be to give a smaller residual error after channel estimation, compared to a conventional receiver (¶0043).

Re claim 51, the claimed limitations recited have been analyzed and rejected with respect to claim 32.

Re claim 52, the claimed limitations recited have been analyzed and rejected with respect to claim 33.

Re claim 55, the claimed limitations recited have been analyzed and rejected with respect to claim 36.

Re claim 57, the claimed limitations recited have been analyzed and rejected with respect to claim 38.

11. Claims 34, 35, 53, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541-545) in view of Olsson et al (US20050111596) and further in view of Onggosanusi (US20040192215).

Re claim 34, Zhang teaches a method configured in an I-Q MIMO MMSE receiver (fig. 1) that jointly detects two signals (fig. 1, the receive antennas) and rejects residual interference (the feed-forward and feedback filters in fig. 1). However Zhang

fails to teach jointly detecting two 8PSK signals and rejecting GMSK interference using I-Q whitening.

Olsson suggests an EDGE system which receives 8PSK-modulated signals and no GMSK signal (¶0042). One of ordinary skill in the art would have found it obvious to received two 8PSK signals.

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the receiving two 8PSK signals of Olsson into the method of Zhang. The motivation to combine Olsson and Zhang would be to deliver a higher raw data-rate,which is well known to one of ordinary skill in the art as a benefit of 8PSK modulation.

Furthermore, Ongggosanusi teaches using whitening to reject residual interference (block 525 in fig. 5, ¶0063).

Therefore taking the combined teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang. The motivation to combine Onggosanusi and Zhang would be to reduce the coloring of the interference signal, which can severely impact performance (¶0063).

Re claim 35, Zhang teaches a method configured in an I-Q MIMO MMSE receiver (fig. 1) that jointly detects two signals (fig. 1, the receive antennas) and rejects residual interference using I-Q whitening (the feed-forward and feedback filters in fig. 1).

However Zhang fails to teach jointly detecting two GMSK signals and rejecting GMSK and 8PSK interference using I-Q whitening.

Olsson teaches a receiver in which a desired signal is GMSK modulated and an interferer signal is GMSK modulated (¶0027, fig. 13), therefore receiving two GMSK signals.

Therefore taking the modified teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the receiving two GMSK signals of Olsson into the method Zhang. The motivation to combine Olsson and Zhang would be to give a large gain over a conventional receiver (¶0063).

Furthermore, Ongggosanusi teaches using whitening to reject residual interference (block 525 in fig. 5, ¶0063).

Therefore taking the combined teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang. The motivation to combine Onggosanusi and Zhang would be to reduce the coloring of the interference signal, which can severely impact performance (¶0063).

Re claim 53, the claimed limitations recited have been analyzed and rejected with respect to claim 34.

Re claim 54, the claimed limitations recited have been analyzed and rejected with respect to claim 35.

12. Claims 39 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) in view of Olsson et al (US20050111596) and further in view of Hafeez et al (US6304618).

Re claim 39, Zhang fails to teach a method comprising sequentially estimating interfering modulation type and training sequence, and performing a maximum likelihood joint channel estimate after all modulation types and training sequences are estimated.

Olsson teaches estimating interfering modulation type and training sequence (¶0043-¶0044, the interferer has a training sequence. Therefore if the modulation type is estimated it would be obvious to estimate the training sequence as well).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Olsson and Zhang would be to give a smaller residual error after channel estimation, compared to a conventional receiver (¶0043).

Hafeez teaches performing a maximum likelihood joint channel estimate after all modulation types and training sequences are estimated (col. 1 lines 23-29, it would be obvious and well known to perform channel estimation after identification of a signal occurs. The identification and synchronization involve detecting a modulation type and comparing the received training sequence with a known sequence).

Therefore taking the combined teachings of Zhang and Hafeez as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Hafeez into the method of Zhang. The motivation to combine Hafeez and Zhang would be to reduce the effects of co-channel and inter-symbol interference as well as provide superior performance (col. 1 lines 23-29).

Re claim 58, the claimed limitations recited have been analyzed and rejected with respect to claim 39.

Allowable Subject Matter

13. Claims13-16, 18, 19 and 61 are allowed.

14. The following is a statement of reasons for the indication of allowable subject matter: the allowable subject matter in claim 18 pertains to said channel parameters of said interfering signal are estimated by calculating channel parameters for all combinations of a desired signal and of said interfering signal and selecting the channel parameters that meet a criterion. The allowable subject matter in claim 19

pertains to detecting whether said system is in a first transmission mode in which said interfering signal is to be discarded or is in a second transmission mode in which said first signal and said second signal are both to be processed as data; and processing said second signal in accordance with said transmission mode.

15. Claims 37, 41, 56, and 60 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon-Viet Q. Nguyen whose telephone number is 571-270-1185. The examiner can normally be reached on monday-friday, alternate friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Nguyen/
Assistant Examiner Art Unit 2611

David C. Payne

DAVID C. PAYNE
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